

## 2001 WETLAND MITIGATION MONITORING REPORT FAP 313 (U.S 34) Henderson County

### Introduction

This document presents the 2001 wetland and vegetation monitoring results of the constructed wetland compensation for FAP 313 (US 34), Henderson County, Illinois (site location NE/4, NE/4, SW/4, Section 34, T 10 N, R 6 W, Burlington, IA quadrangle). The report follows monitoring guidelines and format set forth in the initial IDOT (Illinois Department of Transportation) monitoring request (Brooks 1999) and in two previously submitted monitoring reports (Coopridge et al. 1999, 2000).

Originally a wetland (Plocher *et al.* 1995), the site was converted to agriculture before having been left fallow for several years prior to excavation for mitigation purposes in 1997. Supposedly, eight herbaceous wetland species were planted in the wetland portion of the site (*Iris shrevei*, *Nuphar luteum*, *Nymphaea odorata*, *Pontederia cordata*, *Elodea canadensis*, *Scirpus tabernaemontanii*, *Sagittaria latifolia*, and *Potamogeton nodosus*), along with four species of tree seedlings (*Quercus bicolor*, *Quercus palustris*, *Carya illinoensis*, and *Carya laciniosa*) planted around much of the perimeter. On-site monitoring was conducted for the third consecutive year on 28-29 August, 2001.

Project goals, objectives, and performance criteria for the wetland compensation site are included in this report, as are monitoring methods, 2001 monitoring results, and summary information. Also addressed, is the likelihood that the compensation site will meet each goal, objective, and performance criteria within the 5-year monitoring period.

### Project Goal, Objective, and Performance Standards

The project goal, objective, and performance standards included and evaluated in this report are those identified in the original IDOT tasking order (Brooks 1999) and are as follows:

**Project Goal:** The created wetland community should be a 10.13 acre (4.1 ha) emergent wetland.

**Objective:** A high quality marsh will develop through natural re-colonization and planting of obligate wetland species.

**Performance Standards:**

1. The entire created wetland (10.13 acres) should satisfy the three criteria of the federal wetland definition:
  - a) Predominance of hydrophytic vegetation. More than 50% of the dominant plant species must be hydrophytic.
  - b) Presence of hydric soils. Hydric soil characteristics should be present, or conditions favorable for hydric soil formation should be present at the site.
  - c) Presence of wetland hydrology. The compensation area must be either permanently or periodically inundated at averaged depths less than 2 m (6.6 ft) or have soils that are saturated to the surface for at least 12.5% of the growing season.

2. By the end of the fifth year, a native mean coefficient of conservatism value (native mean C value) of greater than or equal to 3.5 must be achieved, measured over the entire mitigation area. The native mean C value must increase each successive year.
3. By the end of the fifth year, the floristic quality index value (FQI) must be greater than or equal to 20 as measured over the entire mitigation site. The FQI must increase each successive year.
4. By the end of the fifth year, the native mean wetness coefficient (native mean W) must be less than or equal to 0 in the wetland community.
5. The relative importance value of total native plants (RIVn) must increase each successive year.
6. By the end of the fifth year, none of the three most dominant plant species in any of the wetland community zones may be non-native or weedy species, including, but not limited to *Phragmites australis*, *Poa compressa*, *Poa pratensis*, *Lythrum salicaria*, *Salix interior*, *Echinochloa crusgalli* or *Phalaris arundinacea*, unless otherwise indicated on the approved mitigation plan.
7. At the end of the five year monitoring period, at least 25% of the created wetland should be covered by hydrophytic vegetation. The interspersions of water and vegetation should be moderate to high. An open body of water surrounded by a continuous band of fringe vegetation is considered to have a low degree of interspersions, while a checkerboard of open water would have a high degree of interspersions.
8. The planned wetland community should be dominated by tall graminoid plants. Woody vegetation should account for less than 30% of the aerial cover.
9. A 75% survival rate shall be maintained each year for all tree species planted within the wetland mitigation site (Department of the Army, Corps of Engineers permit number: CENR-RD-328500).

## Methods

### Performance Standard 1

#### a) Predominance of Hydrophytic Vegetation

The method for determining dominant hydrophytic vegetation at a wetland site is described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and further explained in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (Federal Interagency Committee for Wetland Delineation 1989). It is based on areal coverage estimates for individual plant species. Each of the dominant plant species is assigned its wetland indicator status rating (Reed 1988). Any plant rated facultative or wetter (i.e., FAC, FAC+, FACW, FACW-, FACW+, and OBL) is considered a hydrophyte. A predominance of vegetation in the wetland plant community exists if more than 50% of the dominant species present are hydrophytic.

#### b) Occurrence of Hydric Soils

To monitor hydric soil development, soils were sampled in 1999 and verified in 2000 and 2001. Soil profile morphology, including horizon color, texture, and structure was described at representative points throughout the site. Additionally, the presence, type, size, and abundance of redoximorphic features were recorded. In the absence of hydric soils indicators, hydrologic data can be used to confirm that conditions favorable for hydric soil formation persist at the site.

#### c) Presence of Wetland Hydrology

The method for determining the presence of wetland hydrology at a site is described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987). Hydrologic indicators may include, but are not limited to, drainage patterns, drift lines, sediment deposits on leaves, watermarks on trees, visual observations of saturated soils, and visual observation of inundation. Monitoring well data from the Illinois State Geological Survey (Fucciolo *et al.* 2001) was also used to determine wetland hydrology.

### **Performance Standards 2, 3, 6 and 8**

#### Plant Community Quality and Composition

The Floristic Quality Assessment (Swink and Wilhelm 1994, Taft *et al.* 1997) was utilized to determine the floristic quality and nativity of the plant communities at the site. This method aids in identifying natural areas, monitoring restored and created wetlands, and comparing the quality of vegetation at different sites. First, each plant species native to Illinois is assigned a conservatism coefficient (C) ranging from zero to 10. Individual conservatism coefficients reflect the probability that a particular taxon correlates with anthropogenic disturbances. Plant species assigned zero tend to have low affinities for natural areas and those assigned 10 have very high affinities. A higher quality site will have more species with high conservatism coefficients. When a complete species list is compiled for a site, the mean coefficient value (mCv) and a site Floristic Quality Index can be calculated as follows:

$$\begin{aligned} N &= \text{the number of native plant species} \\ MCv &= \Sigma C/N \\ FQI &= mCv \sqrt{N} \end{aligned}$$

Sites with FQI values less than 10 indicate low natural quality. Sites with FQI values of 20 or more possess some evidence of natural character and may be considered environmental assets.

#### Planted Tree Seedling Survival

In the fall of 1999, 500 each of the following four tree species were supposedly planted: *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Carya illinoensis* (pecan), and *Carya laciniosa* (shellbark hickory) (letter from T. Brooks, IDOT, February 2000). All individual live trees were counted while walking the perimeter of the site, where trees were planted.

### **Performance Standards 4 and 7**

#### Characterization and Extent of Hydrophytic Vegetation

In addition to being assigned a Coefficient of Conservatism, each species is also assigned a mean wetness coefficient based on the National Wetland Category for Region 3 of the U.S. Fish and Wildlife Service (Reed 1998). Plants are designated as obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), or upland (UPL). Plus (+) and minus (-) signs are added when a plant falls between two of the above categories. For example, FACW+ indicates that a plant is likely to be found in wetter environments than a

FACW plant. Likewise, a FACU- suggests that a plant is almost an upland (UPL) species (may be found in slightly higher (drier) areas than FACU). Each category is assigned a numerical value, ranging from -5 for OBL, 0 for FAC, to +5 for UPL. These values were used to determine the mean Coefficient of Wetness (W) and the percent of the wetland covered by hydrophytic vegetation.

## Performance Standard 5

### Relative Importance Value of Native Plants

A baseline was established along the long axis near U.S. 34 bearing 75° east of north. The first transect was set approximately 25 m (82 ft) east-northeast of a large silver maple in the southwestern corner of the site, bearing 25° west of north. This transect begins at photo station 1 (marked by a permanent metal stake). Transects were set 30 m (98 ft) apart along the baseline; there were seven transects. Transect length and the number of 0.25 m<sup>2</sup> quadrats per transect were variable because of the shape of the mitigation site. Quadrats were set 25 m (82 ft) apart along the transects. The approximate location of the baseline and transects is indicated on the aerial photo and plan sheet. A total of 39 quadrats were sampled. The aerial cover (indicated by cover class) of each species in the quadrats was recorded using the categories listed in Table 1. Percent cover of plant species was analyzed using cover class mid-points (Table 1).

Sampling and analysis methods are based on standard vegetation sampling procedures (Smith 1980, Cox 1985). Plant species frequency values were determined by dividing the number of plots (quadrats in which an individual species occurred) by the total number of plots sampled (42). Relative importance values for individual species and for combined native (RIVn) and combined non-native (RIVa) were calculated by dividing the sum of relative coverage and relative frequency by two and multiplying by 100:  $[(RC + RF)/2 * 100] = RIV$ .

Table 1. Cover classes used for quadrat sampling

Cover class	Range of Cover (%)	Midpoint of Range (%)
1	1-5	3.0
2	5-25	15.0
3	25-50	37.5
4	50-75	62.5
5	75-95	85.0
6	95-100	97.5

### Photography Stations

As indicated and identified in the two previous monitoring reports (Coopridier et al. 1999, 2000), seven photo stations were established along the perimeter of the wetland mitigation site to document changes in plant community over time. Photographs are contained in Appendix E.

## Results

### Performance Standard 1

#### a) Predominance of Hydrophytic Vegetation

Dominant plant species for the wetland are shown in Table 2. All of the dominant plant species are obligate wetland species and therefore, are hydrophytic.

Table 2. Dominant plant species by stratum and wetland indicator status, August, 2001.

Species	Strata	Wetland Indicator Status
<i>Eleocharis acicularis</i>	herb	OBL
<i>Typha angustifolia</i>	herb	OBL
<i>Echinochloa muricata</i>	herb	OBL
<i>Eleocharis obtusa</i>	herb	OBL
<i>Ludwigia alternifolia</i>	herb	OBL

b) Occurrence of Hydric Soils

In the fall of 1994, the wetland portions of the site had saturated soils within 0.3 m (12 in) of the surface (Plocher et al., 1995). In the 1999 monitoring season, all soils in the excavated area were determined to be hydric; this was verified in 2000 and now again in 2001. Because the soils were excavated, assumptions were made about the characteristics of the former topsoil. Based on landscape position, morphological characteristics in the lower profile, the Soil Survey of Henderson County (USDA, 1956), and soils data from the mitigation site assessment (Plocher et al., 1995), the Sawmill series (Cumulic Endoaquoll) was present. The mollic epipedon appears to have been removed. An iron depleted matrix is at the surface and contains many redoximorphic concentrations (Table 3). Standing water and saturated soils in a significant portion of the site were also observed.

Table 3. Soil profile description for excavated wetland compensation area, August, 2001.

Depth (in)	Matrix Color	Concentrations	Depletions	Texture	Structure
0 – 6	2.5YR 4/1	7.5YR 4/6 & 3/4	2.5Y 4/1 fm	Clay	Massive
6 – 15	2.5YR 4/1 & 7.5YR 4/6			Sandy Clay	Massive
15 – 20	2.5YR 4/1	10YR 3.5/6		Sandy Clay	Massive
20 – 26	10YR 4/1			Clay Sand	Massive

c) Presence of Wetland Hydrology

This site is located in the greater Mississippi River floodplain. Although the site may only flood occasionally, the site is affected directly by the Mississippi through water table fluctuations. Field evidence of wetland hydrology included water scouring, wetland drainage patterns, depressional (excavated) landscape, and inundation. An estimated one-quarter of the site was inundated at the time of the survey in 2001.

In 2001, the total area of the created wetland that conclusively satisfied the wetland hydrology criteria was 3.4 ha (8.4 acres) (Fucciolo et al. 2001). The estimated areal extent of 2001 wetland hydrology is shown in Appendix A. 2001 data shows a definite increase in wetland hydrology as compared to the previous two monitoring years. In 2000, only 2.75 ha (6.8 acres) satisfied the wetland hydrology criterion (Fucciolo et al. 2000) and in 1999, only 2.8 ha (6.9 acres) (Fucciolo et al. 1999).

Additional information regarding the presence of hydrophytic vegetation, hydric soils, and wetland hydrology can be found in the Wetland Determination Form (Appendix B).

## Performance Standards 2, 3, 6, 8, and 9

### Plant Community Quality and Composition

The performance standard indicates that the goal for the Mean Coefficient of Conservatism (C) is 3.5 (after 5 years). This was not met in 2001 or in either of the first two monitoring years. The mean C value, including planted species was 3.04, excluding them, 2.63, and excluding only planted trees, 2.93. Although not yet meeting the performance standard, mean C did increase from the previous year.

By the end of the fifth year of monitoring, the FQI is required to be twenty or greater. In 2001, the FQI, including all planted species, was 25.98, without these species 20.91, without only the planted trees 24.50. All of these values met the performance standard and were increases from the previous year's sampling results.

In 2001, the three most dominant plant species (ranked by descending relative importance value) were *Eleocharis acicularis*, *Typha angustifolia*, and *Echinochloa muricata*. This was unchanged from 2000, although *E. muricata* (barnyard grass), a native species, was previously identified as *E. crus-galli*, an exotic. Although the taxonomy and identification of these species is difficult, based on discussion with other botanists at the INHS, we believe the plant to be *E. muricata*. Narrowleaf cattail (*Typha angustifolia*) is generally considered an aggressive exotic in Illinois.

Of the five dominant plant species (Table 2), at least three are "graminoid" (*Eleocharis acicularis*, *E. obtusa*, and *Echinochloa muricata*). Two of these species, specifically the spikerushes (*Eleocharis* spp.), would definitely not be considered "tall graminoids", as specified in stated project performance standards. Although considered an exotic, the most dominant species, narrowleaf cattail, might also be considered a "tall graminoid". Apparently the term "graminoid" is not truly a scientific term, but, instead, is a general term applying to grasses and grass-like plants. In any case, besides the "graminoid" species already discussed here, no others have a relative importance value over 2.5 (Appendix C).

Excluding planted tree species, woody vegetation accounted for only a relatively small portion of the wetland plant community. Cottonwood (*Populus deltoides*), however, was the seventh most "important" plant species, based on relative importance value, and was only slightly less important than seedbox (*Ludwigia alternifolia*), the least important of the dominant species (Appendix C). The only other woody plant species to be sampled was silver maple (*Acer saccharinum*), with a relative importance value of less than one. Other woody species observed, but not sampled included: buttonbush (*Cephalanthus occidentalis*), rough-leaved dogwood (*Cornus drummondii*), green ash (*Fraxinus pennsylvanica*), peach-leaved willow (*Salix amygdaloides*), sandbar willow (*S. exigua*), and black willow (*S. nigra*) (Appendix D).

### Planted Tree Seedling Survival

Only three species of planted trees were observed during 2001 monitoring (Table 4). Pecan (*Carya illinoensis*), swamp white oak (*Quercus bicolor*), and pin oak (*Quercus palustris*) were all commonly sampled, but no shellbark hickory (*Carya laciniosa*) were recorded. It seems likely that no shellbark hickory were ever planted. In 2000, Coopridge reported finding three shellbark hickory seedlings, but questioned their identification (Coopridge et al. 2000).

The majority of sampled tree seedlings appeared healthy and vigorous, with a good chance at long term survival. In 2001, more tree seedlings were counted than in 2000, 764 compared to 750. This can be explained by the difficulty in finding planted trees. By late summer, when monitoring is conducted, surrounding vegetation surrounds and dwarfs the tree seedlings, making their observation difficult. In the future, tree seedlings should be sampled in late spring or early summer (late May or early June), before surrounding vegetation reaches its full height and vigor. Excluding shellbark hickory, average survival for all planted tree species was 50.9%. Although fairly good, survival was substantially lower than the 75% required in the performance standards set forth for this project. This survival rate also excludes the 500 shellbark hickory seedlings that were apparently never planted.

Table 4. Observed survival rates of planted tree seedlings, August, 2001.

Tree Species	Number Planted (supposedly)	Number Observed Alive	Survival Rate (%)
<i>Carya illinoensis</i>	500	114	22.8
<i>Carya laciniosa</i>	500	0	0.0
<i>Quercus bicolor</i>	500	296	59.2
<i>Quercus palustris</i>	500	354	70.8
Overall	2000	764	38.2
Overall (excluding <i>Carya laciniosa</i> )	1500	764	50.9

## Performance Standards 4 and 7

### Characterization and Extent of Hydrophytic Vegetation

The mean Coefficient of Wetness (mean W) for the entire excavated area was strongly negative (Appendix D). Overall, it was -2.9 when including all planted species, -2.7 when excluding all planted species, and -2.9 when excluding planted tree species. Mean W for native species only was -3.2 when including all planted species, -3.0 when excluding all planted species, and -3.2 when excluding planted tree species.

Hydrophytic vegetation appeared to dominate throughout the entire excavated area. All quadrats sampled in 2001 contained dominant hydrophytic vegetation. The periphery of the area tended to contain more species typical of non-wetland habitats (e.g., *Solidago canadensis*, *Cassia fasciculata*, *Ambrosia artemisiifolia*, *Aster pilosus*, *Coronilla varia*, *Setaria faberi*), but nonetheless, this fringe area was still dominated by hydrophytes. Although the vegetation of this fringe area was more mixed than the interior portion of the site, vegetation typical of marsh habitat still tended to dominate, especially *Eleocharis acicularis*. Based on these sampling results, the entire excavated area could be considered to be marsh.

The interspersions of water and vegetation was very favorable. Areas of shallow open water, interspersed with vegetation were common. Up to one third of the area was covered by shallow water up to a few inches in depth. Species such as *Eleocharis acicularis*, *Eleocharis canadensis*, and *Potamogeton nodosus* were common in these inundated areas, along with emergents such as *Typha*, *Scirpus*, and *Sagittaria latifolia*.

## Performance Standard 5

### Relative Importance Value of Native Plants

The relative importance value of native plants (RIVn) in 2001 was 89.97 (Appendix C), a substantial increase from 67.9 in 2000 (Coopridge et al. 2000). Of the five dominant plant species, four are native, only narrowleaf cattail is considered exotic in Illinois. Overall, with the exception of narrowleaf cattail, exotic species were very uncommon in the created wetland area. Including narrowleaf cattail only three exotic species were sampled and only eight were observed. Exotic, non-native species had a total relative importance value of only 10.03, of which narrowleaf cattail accounted for 9.13. By contrast, excluding planted species, 63 species native to Illinois were recorded, of which 46 were both native and perennial (Appendix D). Only 18 annual species were recorded.

## Summary and Recommendations

Monitoring results from 2001 indicate that this wetland compensation site is making steady progress in its development towards a quality wetland community. Currently, the site meets four of the nine Performance Standards (3, 4, 5, and 7) completely. The FQI for the site exceeded twenty (the performance standard), both when including (25.98) and excluding (20.91) planted species and it showed an increase from the previous year. The native, mean Coefficient of Wetness (W) was strongly negative (as required in the performance standard). Native mean W was -3.2 when including all planted species, -3.0 when excluding all planted species, and -3.2 when excluding planted tree species. Also, as stipulated in the performance standard, the relative importance value of native plants (RIVn) in 2001 increased substantially from the previous year (89.97 compared to 67.9 in 2000). Hydrophytic vegetation appeared to dominate throughout the entire excavated area, as all sampled quadrats contained dominant hydrophytic vegetation. Interspersion of water and vegetation was very favorable, with areas of shallow open water, interspersed with vegetation common over much of the area.

Performance Standard 1 (satisfying the three wetland criteria for jurisdictional wetlands) is met for the majority of the site. Dominant hydrophytic vegetation and hydric soils are present across the entire excavated area, although according to the ISGS (Fucciolo et al. 2001) wetland hydrology is present for only 3.4 ha (8.4 acres).

The goal of a mean Coefficient of Conservatism (C) of 3.5 or greater (Performance Standard 2) has not yet been met. The mean C for the site, including planted species, was 3.04, excluding them, 2.63, and excluding only planted trees, 2.93. Although not yet meeting the performance standard, mean C did increase from the previous year. Mean C in 2000 was 3.0 when including all planted species, only 2.4 when excluding them.

In 2001, the three most dominant plant species (ranked by descending relative importance value) were *Eleocharis acicularis*, *Typha angustifolia*, and *Echinochloa muricata*. The prevalence of narrowleaf cattail and barnyard grass as the second and third most dominant species conflicts with another performance standard (Performance Standard 6). Narrowleaf cattail is an aggressive, weedy exotic that tends to dominate wetlands, often to the point of excluding many desirable native plant species. Barnyard grass, although typically short-lived as a dominant, is a weedy annual, typical of disturbed sites.

As specified in Performance Standard 8, tall graminoid plant species must dominate the created wetland, with woody vegetation remaining a minor component (<30% aerial cover).

Based on 2001 sampling results, woody vegetation met the performance standard, with cottonwood being the only woody species having any significant relative importance. In general however, tall graminoids do not dominate the area. Although narrowleaf cattail may or may not be considered a graminoid species, it is definitely undesirable. Three other graminoid species are among the dominant plants (*Eleocharis acicularis*, *E. obtusa*, and *Echinochloa muricata*), although it is debatable whether any of these would be considered "tall". The spikerushes, *Eleocharis acicularis* and *E. obtusa*, definitely are not.

With regard to survival of planted tree seedlings, sampling results clearly do not meet those set forth in Performance Standard 9. First of all, it appears that the 500 shellbark hickory seedling that were supposed to be planted, never were. Even when excluding these trees, average survival for all planted trees was only 50.9%, well under the 75% required. In fact, no individual tree species even had a survival rate of 75%, although pin oak did come close, with a survival rate of almost 71%. Survival rates could be somewhat higher than calculated here, however, based on the difficulty in finding planted trees. By late summer, when monitoring is conducted, surrounding vegetation dwarfs and hides many of the planted tree seedlings, making location difficult. No doubt some trees are missed. In future years, trees should be monitored earlier in the year, possibly late May to early June, before surrounding vegetation reaches full height and vigor.

To summarize, although this site continues to develop into quality wetland habitat, it is not without its problems. Foremost of these problems is the prevalence of narrowleaf cattail (*Typha angustifolia*). Although very closely related to and commonly hybridizing with the native common cattail (*Typha latifolia*), narrowleaf is designated an exotic in Illinois. Considered very similar ecologically, narrowleaf cattail is generally regarded to be even more aggressive and weedy than common cattail. In the future, however, it may be useless or impossible to consider these species separately, given their degree of hybridization. This hybridization is only expected to increase over time, when a hybrid cattail complex will cover most of Illinois. Much of the cattail already identified in Illinois as narrowleaf is, no doubt, the hybrid. At this point, however, narrowleaf cattail is still considered separately from common cattail. Furthermore, it is considered an aggressive, weedy, undesirable exotic. The prevalence and dominance of this species directly contributes to the failure to meet two of the performance standards (2 & 6), and possibly a third (Performance Standard 8), depending on whether or not cattail is to be considered a "graminoid". Although the relative importance value of narrowleaf cattail did decrease substantially from the previous year (from 16.67 to 9.13), it remained the second most "important" plant species. This decrease in narrowleaf cattail was unexpected and defies explanation. To our knowledge, no cattail control measures had been undertaken, nor had any physical manipulation of the area (e.g., additional excavation). Muskrats (*Ondatra zibethicus*) are known to feed heavily on cattail and can, in some cases, control it or at least greatly decrease its prevalence. Although, no doubt, muskrats are present in the wetland mitigation area, there was no evidence of their presence in numbers great enough to significantly impact cattail prevalence. No obvious signs of herbivory were noted and no muskrat lodges were observed. Hopefully, this trend of cattail decrease will continue, although there is no tangible reason to think so. If, after next year's sampling, this trend continues, cattail control measures may not be necessary. However, if narrowleaf cattail prevalence remains relatively stable, or increases, control measures will have to be taken if performance standards are to be met.

In addition to possible cattail control, if Performance Standards 2 and 8 are to be met, additional planting of tall, native, perennial, graminoid hydrophytes may be necessary. Numerous species of this type are already present (e.g., *Juncus* spp., *Carex* spp., *Leersia oryzoides*, *Panicum virgatum*, *Scirpus fluviatilis*, *Scirpus tabernaemontanii*), but additional plantings might also be necessary to boost the mean Coefficient of Conservatism and establish dominance by "tall, graminoid" plant species, in addition to strengthening and stabilizing the

FQI. Species such as *Spartina pectinata*, *Scirpus americanus*, *Scirpus cyperinus*, *Scirpus acutus*, and *Carex lacustris* would all be highly desirable.

Performance Standard 1 (satisfying the three wetland criteria for jurisdictional wetlands for at least 4.1 ha) may not be able to be met without further excavation. Based on ISGS information (Fucciolo et al. 2001), wetland hydrology is present for only 3.4 ha of the 4.1 required. The portion of the site demonstrating wetland hydrology did increase from the previous year (Coopridier et al. 2000), but it is unclear if this pattern will continue, likely it will not. In the likelihood that wetland hydrology will not increase on its own to meet the stated area requirement, further excavation of the drier areas would be necessary.

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Appendix A. Estimated areal extent of 2001 wetland hydrology (Fucciolo et al. 2001).

**FAP 313 (U.S. 34) Wetland Compensation Site**  
 (based on data collected between September 1, 2000 and September 1, 2001)  
 (map based on USGS digital orthophotograph, Burlington NW quarter quadrangle)

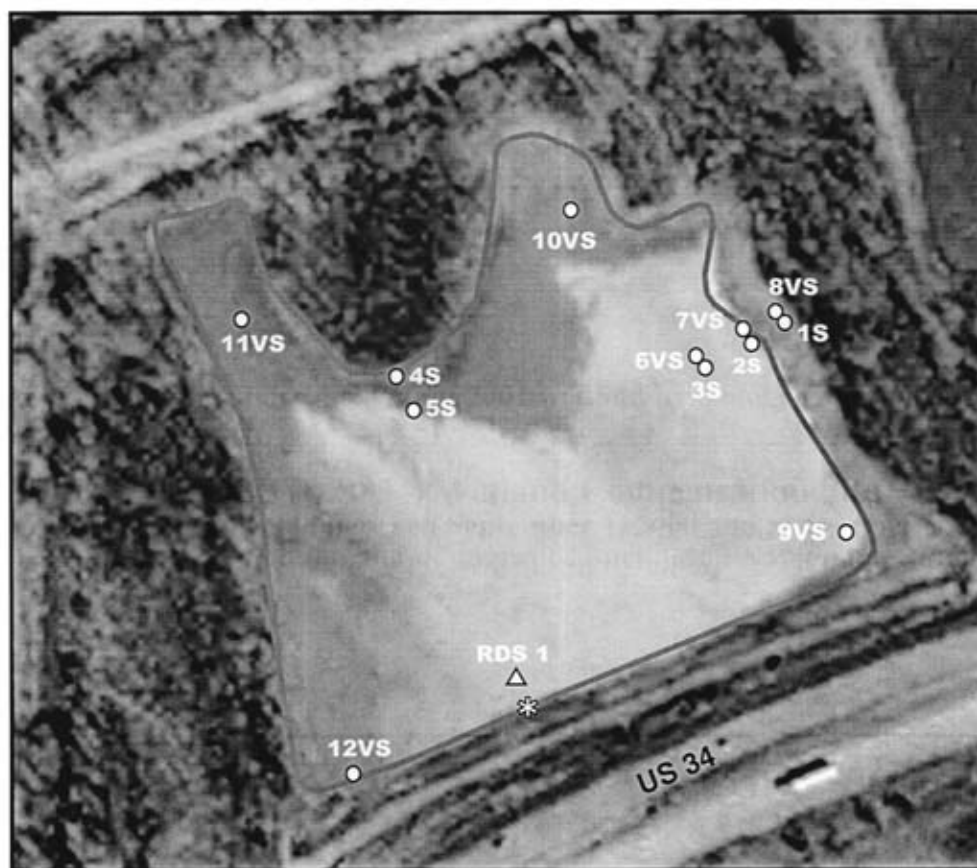


Figure prepared by ISGS

- soil-zone monitoring well
- ✱ rain gauge
- △ RDS data logger
- estimated areal extent of 2001 wetland hydrology

0 100 m 400 ft



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**Appendix B. Routine wetland determination form, August 2001.**

**Routine On-site Wetland Determination**  
Excavated Wetland Compensation Area  
(page 1 of 2)

**Field Investigators:** Wilm, Kurylo, Feist, Tessene      **Date:** 28-29 August, 2001  
**Contract Number:** 88516      **Project Name:** FAP 313 (U.S. 34)  
**State:** Illinois      **County:** Henderson      **Applicant:** IDOT District 4  
**Site Name:** Marsh (Excavated Wetland Compensation Area)  
**Legal Description:** NE1/4 NE 1/4 SW 1/4 sec. 34 T.10N. - R.6W.  
**Location:** Begins approximately 23 m (75 ft) north of U.S 34, 91 m (300 ft) east of an excavated lake in Gulfport, and south of Crystal Lake.

Do normal environmental conditions exist at this site?      Yes: X      No:  
Have the vegetation, soils and/or hydrology been significantly disturbed?      Yes:      No: X

**VEGETATION**

<b>Dominant Plant Species</b>	<b>Indicator Status</b>	<b>Stratum</b>
<i>Echinochloa muricata</i>	OBL	herb
<i>Eleocharis acicularis</i>	OBL	herb
<i>Eleocharis obtusa</i>	OBL	herb
<i>Ludwigia alternifolia</i>	OBL	herb
<i>Typha angustifolia</i>	OBL	herb

Percentage of plant species that are OBL, FACW, FAC+, or FAC: 100%

**Hydrophytic vegetation?** Yes: X      No:

**Rationale:** More than 50% of the dominants are OBL, FACW, FAC+ or FAC.

**SOILS**

Series and phase: Sawmill silty clay loam (Cumulic Endoaquoll)

On Henderson County hydric soils list? Yes:      No:      Undetermined: X

Is the soil a histosol? Yes:      No: X

Histic epipedon present? Yes:      No: X

Redox concentrations: Yes: X      No:      Color: 7.5YR 4/6 & 3/4

Redox depletions: Yes: X      No:      Color: 2.5Y 4/1 fm

Matrix color: 2.5YR 4/1 over a mixture of 2.5YR 4/1 and 7.5YR 4/6

Other indicators: The site is an excavated depression in the floodplain of the Mississippi River. Surface saturation and inundation were also observed.

**Hydric soils?** Yes: X      No:

**Rationale:** The soils in this area are hydric. This is evidenced by a low chroma matrix and redoximorphic features.

**Routine On-site Wetland Determination**  
 Excavated Wetland Compensation Area  
 (page 2 of 2)

**Field Investigators:** Wilm, Kurylo, Feist, Tessene  
**Contract Number:** 88516  
**State:** Illinois **County:** Henderson  
**Site Name:** Marsh (Excavated Wetland Compensation Area)  
**Legal Description:** NE1/4 NE 1/4 SW 1/4 sec. 34 T.10N. - R.6W.  
**Location:** Begins approximately 23 m (75 ft) north of U.S 34, 91 m (300 ft) east of an excavated lake in Gulfport, and south of Crystal Lake.

**Date:** 28-29 August, 2001  
**Project Name:** FAP 313 (U.S. 34)  
**Applicant:** IDOT District 4

**HYDROLOGY**

Inundated? Yes: X (partially) No: Depth of standing water: Up to 0.15 m (6 in)  
 Depth to saturated soil: Surface to 0.6 m (24 in)  
 Overview of hydrological flow through the system: This site is located in an excavated area that is affected by the Mississippi River via water table fluctuations and occasional flooding.  
 Additional hydrologic inputs include precipitation and sheet flow from higher ground.  
 Evapotranspiration, soil infiltration, and possible ground water recharge are hydrologic outputs.  
 Size of watershed: Approximately 259,000 km<sup>2</sup> (100,000 mi<sup>2</sup>) (estimated from 119,000 m<sup>2</sup> drainage area at Keokuk, IA)  
 Other field evidence observed: Standing water, surface scouring, wetland drainage patterns, and presence of algal mats.

**Wetland hydrology?** Yes: X No:  
**Rationale:** Observation of inundation, location in an excavated area, and field indicators of wetland hydrology suggest that this site is inundated for a significant duration during the growing season.

**DETERMINATION AND RATIONALE**

**Is this site a wetland?** Yes: X No:  
**Rationale for decision:** This site has hydrophytic vegetation, hydric soils, and wetland hydrology.

**Determined by:** Brian Wilm, Paul Tessene and Mary Ann Feist  
 (vegetation and hydrology)  
 Jesse Kurylo (soils and hydrology)  
 Illinois Natural History Survey  
 Center for Wildlife Ecology  
 607 East Peabody Drive  
 Champaign, Illinois 61820  
 (217) 244-2176 (Wilm)

Appendix C. Vegetation sampling results for FAP 313 (U.S. 34) mitigation wetland (n=42), Henderson County, IL, August 28-29, 2001.

Species	Total Cover (%)	Average % Cover per Plot	Relative Cover (%)	Frequency	Relative Frequency (%)	Relative Importance Value
<i>Eleocharis acicularis</i> <sup>P</sup>	2322.5	55.30	35.33	0.81	12.19	23.76
<i>Typha angustifolia</i> <sup>*P</sup>	634.5	15.11	9.65	0.57	8.60	9.13
<i>Echinochloa muricata</i> <sup>A</sup>	510.0	12.14	7.76	0.43	6.45	7.11
<i>Eleocharis obtusa</i> <sup>A</sup>	352.0	8.38	5.35	0.38	5.73	5.54
<i>Ludwigia alternifolia</i> <sup>P</sup>	286.0	6.81	4.35	0.31	4.66	4.51
<i>Bidens cernua</i> <sup>A</sup>	233.5	5.56	3.55	0.36	5.38	4.46
<i>Populus deltoides</i> <sup>P</sup>	216.0	5.14	3.29	0.33	5.02	4.15
<i>Eleocharis erythropoda</i> <sup>P</sup>	258.0	6.14	3.92	0.17	2.51	3.22
<i>Ammania coccinea</i> <sup>A</sup>	109.5	2.61	1.67	0.31	4.66	3.16
<i>Bidens aristosa</i> <sup>A</sup>	210.5	5.01	3.20	0.17	2.51	2.86
<i>Solidago canadensis</i> <sup>P</sup>	163.0	3.88	2.48	0.17	2.51	2.49
<i>Cyperus strigosus</i> <sup>P</sup>	90.0	2.14	1.37	0.24	3.58	2.48
<i>Potamogeton nodosus</i> <sup>P</sup>	173.0	4.12	2.63	0.14	2.15	2.39
<i>Salix exigua</i> <sup>P</sup>	118.5	2.82	1.80	0.19	2.87	2.34
<i>Rotala ramosior</i> <sup>A</sup>	48.0	1.14	0.73	0.19	2.87	1.80
<i>Cyperus aristatus</i> <sup>A</sup>	88.5	2.11	1.35	0.14	2.15	1.75
<i>Aster pilosus</i> <sup>P</sup>	66.0	1.57	1.00	0.14	2.15	1.58
<i>Cassia fasciculata</i> <sup>A</sup>	95.5	2.27	1.45	0.10	1.43	1.44
<i>Salix nigra</i> <sup>P</sup>	90.0	2.14	1.37	0.07	1.08	1.22
<i>Leersia oryzoides</i> <sup>P</sup>	39.0	0.93	0.59	0.12	1.79	1.19
<i>Solidago gigantea</i> <sup>P</sup>	58.5	1.39	0.89	0.10	1.43	1.16
<i>Bidens tripartita</i> <sup>A</sup>	27.0	0.64	0.41	0.12	1.79	1.10
<i>Nymphaea odorata</i> <sup>P</sup>	67.5	1.54	1.03	0.07	1.08	1.05
<i>Scirpus tabernaemontani</i> <sup>P</sup>	43.5	1.04	0.66	0.07	1.08	0.87
<i>Acer saccharinum</i> <sup>P</sup>	12.0	0.29	0.18	0.10	1.43	0.81
<i>Eupatorium serotinum</i> <sup>P</sup>	21.0	0.50	0.32	0.07	1.08	0.70

\*Indicates species not native to Illinois.

A – Annual

P – Perennial

(Table continues on following page.)

## Appendix C. Continued.

Species	Total Cover (%)	Average % Cover per Plot	Relative Cover (%)	Frequency	Relative Frequency (%)	Relative Importance Value
<i>Ludwigia palustris americana</i> <sup>P</sup>	21.0	0.50	0.32	0.07	1.08	0.70
<i>Setaria glauca</i> <sup>*A</sup>	21.0	0.50	0.32	0.07	1.08	0.70
<i>Sagittaria latifolia</i> <sup>P</sup>	40.5	0.96	0.62	0.05	0.72	0.67
<i>Scirpus fluviatilis</i> <sup>P</sup>	40.5	0.96	0.62	0.05	0.72	0.67
<i>Ambrosia artemisiifolia</i> <sup>A</sup>	9.0	0.21	0.14	0.07	1.08	0.61
<i>Lindernia dubia</i> <sup>A</sup>	9.0	0.21	0.14	0.07	1.08	0.61
<i>Aster simplex</i> <sup>P</sup>	18.0	0.43	0.27	0.05	0.72	0.50
<i>Alisma plantago-aquatica</i> <sup>P</sup>	6.0	0.14	0.09	0.05	0.72	0.40
<i>Cyperus esculentus</i> <sup>P</sup>	6.0	0.14	0.09	0.05	0.72	0.40
<i>Cyperus</i> sp.	6.0	0.14	0.09	0.05	0.72	0.40
<i>Carex tribuloides</i> <sup>P</sup>	15.0	0.36	0.23	0.02	0.36	0.29
<i>Mimulus ringens</i> <sup>P</sup>	15.0	0.36	0.23	0.02	0.36	0.29
<i>Sparganium eurycarpum</i> <sup>P</sup>	15.0	0.36	0.23	0.02	0.36	0.29
<i>Carex scoparia</i> <sup>P</sup>	3.0	0.07	0.05	0.02	0.36	0.20
<i>Chamaesyce maculata</i> <sup>A</sup>	3.0	0.07	0.05	0.02	0.36	0.20
<i>Penthorum sedoides</i> <sup>P</sup>	3.0	0.07	0.05	0.02	0.36	0.20
<i>Polygonum punctatum</i> <sup>A</sup>	3.0	0.07	0.05	0.02	0.36	0.20
<i>Rumex crispus</i> <sup>*P</sup>	3.0	0.07	0.05	0.02	0.36	0.20
Unidentified Grass	3.0	0.07	0.05	0.02	0.36	0.20
Native Species	5912.0	140.76	90.00	5.96	90.02	89.97
Non-native Species	658.5	15.68	10.02	0.66	10.04	10.03
Perennial Species	4845.0	115.36	73.71	4.11	62.05	67.86
Native Perennial Species	4207.5	100.18	64.01	3.52	53.09	58.53
Annual Species	1719.5	40.94	26.17	2.45	36.93	31.54
All Species	6573.5	156.51	100.07	6.64	100.42	100.20

\*Indicates species not native to Illinois.

A - Annual

P - Perennial

Appendix D. Plant species list for FAP 313 (U.S. 34) mitigation wetland, Henderson County, Illinois, August, 2001.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
<i>Acer saccharinum</i>	silver maple	shrub, herb	FACW	-3	1	P
<i>Agalinis purpurea</i>	false foxglove	herb	FACW	-3	6	A
<i>Alisma plantago-aquatica</i>	broad-leaf water-plantain	herb	OBL	-5	2	P
<i>Ambrosia artemisiifolia</i>	common ragweed	herb	FACU	3	0	A
<i>Ammannia coccinea</i>	long-leaved ammannia	herb	OBL	-5	5	A
<i>Apocynum sibiricum</i>	Indian hemp	herb	FAC+	-1	2	P
<i>Asclepias incarnata</i>	swamp milkweed	herb	OBL	-5	4	P
<i>Aster pilosus</i>	hairy aster	herb	FACU+	4	0	P
<i>Aster simplex</i>	panicled aster	herb	FACW	-3	3	P
<i>Bidens aristosa</i>	swamp marigold	herb	FACW	-3	1	A
<i>Bidens cernua</i>	nodding beggar-ticks	herb	OBL	-5	2	A
<i>Bidens tripartita</i>	beggartick	herb	OBL	-5	2	A
<i>Bidens vulgata</i>	sticktight	herb	FACW	-3	0	A
<i>Carex scoparia</i>	broom sedge	herb	FACW	-3	5	P
<i>Carex</i> spp.	sedges	herb	----	--	--	--
<i>Carex tribuloides</i>	sedge	herb	FACW+	-4	3	P
<i>Carex vulpinoidea</i>	fox sedge	herb	OBL	-5	3	P
<i>Carya illinoensis</i>	pecan	shrub	FACW	-3	6 (planted)	P
<i>Cassia fasciculata</i>	golden cassia	herb	FACU-	2	1	A
<i>Cephalanthus occidentalis</i>	buttonbush	shrub, herb	OBL	-5	4	P
<i>Chamaesyce maculata</i>	nodding spurge	herb	FACU-	2	0	A
<i>Cornus drummondii</i>	rough-leaved dogwood	shrub, herb	FAC	0	2	P
<i>Coronilla varia</i>	crown vetch	herb	UPL	5	*	P

\*Species not native to Illinois

(Species list continues on following page.)

Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
<i>Cyperus aristatus</i>	bearded flat sedge	herb	OBL	-5	2	A
<i>Cyperus esculentus</i>	chufa	herb	FACW	-3	0	P
<i>Cyperus strigosus</i>	straw colored flatsedge	herb	FACW	-3	0	P
<i>Echinochloa muricata</i>	barnyard grass	herb	OBL	-5	0	A
<i>Echinodorus berteroi lanceolatus</i>	burhead	herb	OBL	-5	6	P
<i>Eleocharis acicularis</i>	needle spike rush	herb	OBL	-5	3	P
<i>Eleocharis erythropoda</i>	spikerush	herb	OBL	-5	3	P
<i>Eleocharis obtusa</i>	spikerush	herb	OBL	-5	2	A
<i>Elodea canadensis</i>	anacharis	herb	OBL	-5	5 (planted)	P
<i>Erigeron annuus</i>	annual fleabane	herb	FAC-	1	1	B**
<i>Erigeron strigosus</i>	daisy fleabane	herb	FAC-	1	2	P
<i>Eupatorium serotinum</i>	late boneset	herb	FAC+	-1	1	P
<i>Fraxinus pennsylvanica</i>	green ash	shrub, herb	FACW	-3	2	P
<i>Geum laciniatum</i>	rough avens	herb	FACW	-3	2	P
<i>Hordeum jubatum</i>	fox-tail barley	herb	FAC+	-1	*	P
<i>Iris shrevei</i>	southern blue flag	herb	OBL	-5	5 (planted)	P
<i>Juncus effusus solutus</i>	common rush	herb	OBL	-5	4	P
<i>Juncus interior</i>	inland rush	herb	FAC+	-1	3	P
<i>Juncus torreyi</i>	torrey rush	herb	FACW	-3	3	P
<i>Leersia oryzoides</i>	rice cutgrass	herb	OBL	-5	3	P
<i>Leptochloa</i> sp.	sprangle top	herb	----	--	--	--
<i>Lindernia dubia</i>	false pimpernel	herb	OBL	-5	5	A

\*Species not native to Illinois

\*\*Biennial

(Species list continues on following page.)

Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
<i>Lobelia cardinalis</i>	cardinal-flower	herb	OBL	-5	6	P
<i>Ludwigia alternifolia</i>	seedbox	herb	OBL	-5	5	P
<i>Ludwigia palustris americana</i>	marsh purslane	herb	OBL	-5	4	P
<i>Lycopus americanus</i>	common water horehound	herb	OBL	-5	3	P
<i>Lythrum alatum</i>	winged loosestrife	herb	OBL	-5	5	P
<i>Mimulus ringens</i>	monkey flower	herb	OBL	-5	5	P
<i>Nymphaea odorata</i>	fragrant water lily	herb	OBL	-5	6 (planted)	P
<i>Panicum capillare</i>	witch grass	herb	FAC	0	0	A
<i>Panicum virgatum</i>	prairie switchgrass	herb	FAC+	-1	4	P
<i>Penthorum sedoides</i>	ditch stonecrop	herb	OBL	-5	2	P
<i>Phalaris arundinacea</i>	reed canary grass	herb	FACW+	-4	*	P
<i>Polygonum amphibium</i>	water smartweed	herb	OBL	-5	3	P
<i>Polygonum punctatum</i>	dotted smartweed	herb	OBL	-5	3	A
<i>Pontederia cordata</i>	pickerelweed	herb	OBL	-5	8 (planted)	P
<i>Populus deltoides</i>	eastern cottonwood	shrub, herb	FAC+	-1	2	P
<i>Potamogeton nodosus</i>	American pondweed	herb	OBL	-5	7 (planted)	P
<i>Potamogeton pectinatus</i>	comb pondweed	herb	OBL	-5	5	P
<i>Prunella vulgaris</i>	self-heal	herb	FAC	0	*	P
<i>Quercus bicolor</i>	swamp white oak	shrub	FACW+	-4	7 (planted)	P
<i>Quercus palustris</i>	pin oak	shrub	FACW	-3	4 (planted)	P
<i>Rotala ramosior</i>	tooth-cup	herb	OBL	-5	4	A
<i>Rudbeckia hirta</i>	black-eyed susan	herb	FACU	3	2	P
<i>Rumex crispus</i>	curly dock	herb	FAC+	-1	*	P

\*Species not native to Illinois

(Species list continues on following page.)

# Appendix D. Continued.

Scientific name	Common name	Stratum	Wetland indicator status	Coefficient of Wetness	Coefficient of Conservatism	Annual or Perennial
<i>Sagittaria latifolia</i>	arrowhead	herb	OBL	-5	4 (planted)	P
<i>Salix amygdaloides</i>	peach-leaved willow	shrub, herb	FACW	-3	4	P
<i>Salix exigua</i>	sandbar willow	shrub, herb	OBL	-5	1	P
<i>Salix nigra</i>	black willow	shrub, herb	OBL	-5	3	P
<i>Scirpus fluviatilis</i>	river bulrush	herb	OBL	-5	3	P
<i>Scirpus tabernaemontanii</i>	great bulrush	herb	OBL	-5	4 (planted)	P
<i>Setaria faberi</i>	giant foxtail	herb	FACU+	4	*	A
<i>Setaria glauca</i>	pigeon grass	herb	FAC	0	*	A
<i>Solidago canadensis</i>	Canada goldenrod	herb	FACU	3	1	P
<i>Solidago gigantea</i>	late goldenrod	herb	FACW	-3	3	P
<i>Sparganium eurycarpum</i>	burreed	herb	OBL	-5	5	P
<i>Tridens flavus</i>	purple top	herb	UPL	5	1	P
<i>Typha angustifolia</i>	narrow-leaved cattail	herb	OBL	-5	*	P
<i>Typha latifolia</i>	cattail	herb	OBL	-5	1	P
<i>Verbena hastata</i>	blue vervain	herb	FACW+	-4	3	P

\*Species not native to Illinois

Number of hydrophytic species (including all planted species) – 70 (86.4%)

Number of hydrophytic species (excluding all planted species) – 60 (84.5%)

Number of hydrophytic species (excluding planted tree species) – 67 (85.9%)

Number of species native to Illinois (including all planted species) – 73 (90.1%)

Number of species native to Illinois (excluding all planted species) – 63 (88.7%)

Number of species native to Illinois (excluding planted tree species) – 70 (89.7%)

FQI (including all planted species) =  $R/\sqrt{N} = 222/\sqrt{73} = 25.98$

FQI (excluding all planted species) =  $R/\sqrt{N} = 166/\sqrt{63} = 20.91$

(Summary information continues on the following page.)

#### Appendix D. Continued.

FQI (excluding planted tree species) =  $R/\sqrt{N} = 205/\sqrt{70} = 24.50$

Mean Coefficient of Conservatism (C) (including all planted species) =  $R/N = 222/73 = 3.04$

Mean Coefficient of Conservatism (C) (excluding all planted species) =  $R/N = 166/63 = 2.63$

Mean Coefficient of Conservatism (C) (excluding planted tree species) =  $R/N = 205/70 = 2.93$

Mean Coefficient of Wetness (including all planted species) =  $-235/81 = -2.9$

Mean Coefficient of Wetness (excluding all planted species) =  $-190/71 = -2.7$

Mean Coefficient of Wetness (excluding planted tree species) =  $-225/78 = -2.9$

Mean Coefficient of Wetness for native species (including all planted species) =  $-233/73 = -3.2$

Mean Coefficient of Wetness for native species (excluding all planted species) =  $-188/63 = -3.0$

Mean Coefficient of Wetness for native species (excluding planted tree species) =  $-223/70 = -3.2$

Number of perennial species (including all planted species) – 62 (77.5%)

Number of perennial species (excluding all planted species) – 52 (74.3%)

Number of perennial species (excluding planted tree species) – 59 (76.6%)

Number of perennial species native to Illinois (including all planted species) – 56 (70%)

Number of perennial species native to Illinois (excluding all planted species) – 46 (65.7%)

Number of perennial species native to Illinois (excluding planted tree species) – 53 (68.8%)

Number of annual species (including all planted species) – 18 (22.5%)

Number of annual species (excluding all planted species) – 18 (25.7%)

Number of annual species (excluding planted tree species) – 18 (23.4%)

---

Appendix E. Photographs from permanent photograph stations.

A.



B.



Figure 1. A. Photo Station 1 facing North/Northwest, B. Photo Station 2 facing North/Northwest.

A.



B.



Figure 2. A. Photo Station 3 facing North/Northwest, B. Photo Station 4 facing West/Southwest.

A.



B.



Figure 3. A. Photo Station 5 facing West/Southwest, B. Photo Station 6 facing North/Northeast.

A.



B.



Figure 4. A. Photo Station 6 facing South, B. Photo Station 7 facing North.



Figure 5. Photo Station 7 facing South.